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BUREAU OF ENTOMOLOGY AND PLANT QUARANTINE

NEWS LETTER

FOR MARCH 1938

Vol. V, No. 5 (Not for publication) May 1, 1938

FRUIT INSECT INVESTIGATIONS

Daily flight period of Cnemeplatia sericea Horn.--This small tenebrionid was taken in considerable numbers in a fig orchard in a series of collections made by Dwight F. Barnes, of the Fresno, Calif., laboratory, in 1937. It is a minor pest of fallen figs. The remarkably short daily flight period of the beetle was shown by collections made at 15-minute intervals from a motor-driven net revolving horizontally at a height of 3 feet and at a speed of 26 miles per hour. The time of flight was evidently controlled by light intensity, which was measured by means of a photoelectric exposure meter. The following table combines the records of 6 evenings--July 20 and 22 and September 7, 14, 17, and 23, and shows the number of C. sericea taken at various light values with a rotary net at Round Mountain in 1937.

Light value	C. sericea taken		Light value	C. sericea taken	
Foot candles	Number	Percent	Foot candles	Number	Percent
160	0	0.0	3.2	2	0.2
65	0	.0	2.5	0	.0
40	5	.4	1.0	37	3.3
20	0	.0	.5	775	69.3
10	1	.1	.25	292	26.1
8	0	.0	.0	3	.3
5	4	.3	Total	1,119	100.0

Ethylene dichloride and dichlorethyl ether for peach borer control.--Oliver I. Snapp and J. R. Thomson, Jr., of the Fort Valley, Ga., laboratory, have reported further work on ethylene dichloride and dichlorethyl ether for the control of Conopia exitiosa Say. In experiments with dug nursery stock a 2.5-percent emulsion of ethylene dichloride gave a control ranging from 94 to 100 percent; a 3-percent strength gave from 98 to 100 percent control. The data in hand from 4 years' work indicate that peach borer larvae can be eliminated from dug nursery stock by spraying the soil packed and settled around bundles of stock heeled in an upright position with 2.5-or 3-percent ethylene dichloride emulsion at the rate of 1 quart to each 15 trees. The treatment should be made in dry soil while the nursery stock is fully dormant. In the experiments with orchard trees, ethylene dichloride emulsion applied in midwinter during a period of unusually cold weather did not give as good results as in previous experiments during periods of moderate or normal midwinter conditions in the South, when good results have been obtained. Dichlorethyl ether, a water-soluble material, gave remarkably good control of the peach borer in orchard trees during midwinter, confirming results of previous experiments which indicated that this material has its greatest effectiveness against the borer and the greatest safety on peach trees during cold weather. With dug nursery stock, dichlorethyl ether at the rate of 2/3 of a quart of approximately 1-percent solution to five trees gave only partial control and slight injury to the bark of several trees treated.

Empirical dosage-survival curve impractical in Japanese beetle soil-poison tests.--W. E. Fleming, of the Japanese beetle laboratory at Moorestown, N. J., has just submitted a report on studies he has made of the possibility of using an empirical dosage-survival curve as a standard of insecticidal effectiveness in tests with stomach-poison insecticides against larvae of the Japanese beetle in soil. In work of this kind it has been the practice to conduct parallel tests of the new materials and of a standard insecticide at the same time under controlled conditions. Freshly applied acid lead arsenate has been used as the standard of insecticidal action. During the period from October 20, 1933, when this procedure became standardized, to January 17, 1938, data have been obtained on the acid lead arsenate standards for 55 series of tests. A statistical study has been made of this accumulation of data in the hope of developing an empirical curve that could be used as the standard, instead of running lead arsenate tests in connection with each series. Analysis of variance has shown, however, that the variation between the standard lead arsenate treatments run at different times was much greater than could be accounted for by random sampling and that the survivals in the different standards were significantly different. It was therefore concluded that an empirical standard dosage-survival curve could not be substituted for parallel tests of the lead arsenate standard, in determining the effectiveness of a material as a stomach poison against larvae of the Japanese beetle in the soil.

MEXICAN FRUITFLY CONTROL

Catches of Mexican fruitfly increase.--Shipment and canning of fruit continue in a satisfactory manner. Fruit from infested parts of groves is being sterilized before shipment is permitted. Trap catches of *Anastrepha ludens* Loew increased from 71 in February to 113 in March. From the appearance of these flies it is evident that many of them were young and had recently emerged. Larvae were found in grapefruit on 121 premises throughout the month. As was to be expected with a below-normal fly population, the number of properties found infested this month is approximately only one-ninth as great as for the same period last season. The numbers of fruitflies identified in March are shown in the following table.

Species	Texas	Mexico
Adults		
A. ludens	113	17
Premises	64	10
A. serpentina Wied	16	6
Premises	14	6
A. sp. "L"	2	1
Premises	2	1
A. sp. "Y"	11	29
Premises	10	3
A. pallens Coq	309	62
Premises	130	12
T. curvicauda Gerst	6	1
Premises	4	1
Total	681	149
Larvae		[1]
A. ludens	1,704	1
Premises	121	1
A. sp. not *ludens*	0	[1] 32
Total	1,825	34

[1] From market fruit in Matamoros.

CEREAL AND FORAGE INSECT INVESTIGATIONS

Estimated damage by the sugarcane borer in 1937.--J. W. Ingram, W. E. Haley, and L. J. Charpentier made a joint survey with L. O. Ellisor, of the Louisiana Experiment Station, University, La., during the harvesting season of 1937 to determine the extent of borer injury to sugarcane in Louisiana. Counts of borer-infested internodes per 100 stalks were made on 3 commonly grown varieties of sugarcane in 2 locations in each of 10 representative areas. The average percentage of internodes found infested was 16.05 and of stalks infested, 63.47. In similarly conducted surveys 8.7 percent of the internodes were found infested in 1936 and 8.1 percent in 1935. From these and production figures, it is estimated that sugar farmers in Louisiana lost over $3,000,000 in 1937 as a result of borer injury.

Insecticidal control of sugarcane borer in summer-planted cane.--In cooperation with Dr. Ellisor, Messrs. Ingram, Haley, and Charpentier conducted preliminary experiments with synthetic cryolite (86 percent sodium fluoaluminate), natural cryolite (90 percent sodium fluoaluminate), and bordeaux-calcium arsenate (34 percent arsenic pentoxide and 10 percent copper sulphate) as insecticides for the sugarcane borer on sugarcane planted in August 1937. Duplicate 16-plot Latin-square experiments were conducted with plots 1/20 acre in size. Dusts were applied at weekly intervals from September 2 to November 18. Examinations were made of all borer-killed plants on the inner 198 row feet of each plot 3 times at 3-week intervals, beginning on October 4. On December 2 and 3 final examinations were made, when all jointed plants in the same area included in previous examinations were examined for borer injury and stages. No injury was found in the nonjointed plants. A summary of results of all examinations follows.

	Reserve plantation experiment			Roseland plantation experiment		
Plots	Total borer-infested plants	Total borer stages	Uninfested jointed plants	Total borer-infested plants	Total borer stages	Uninfested jointed plants
	Number	Number	Number	Number	Number	Number
Synthetic cryolite---	93	49	155	31	16	184
Natural cryolite---	91	41	166	26	8	193
Bordeaux cal.-ars---	991	582	19	419	264	112
Check-------	748	454	25	330	200	109

When analyzed statistically, the number of borer-infested plants in both sets of cryolite plots was found to be highly significantly less than in the check plots in each experiment.

JAPANESE BEETLE CONTROL

Certification of nursery stock.--Mild weather toward the end of March permitted early digging of nursery stock in most sections of the regulated area. In the New York City district four carloads of evergreens were certified for movement to nonregulated territory and several truckloads of certified plants were exchanged by classified establishments. Inspection calls in this area totaled 635 for the month, as compared to 290 in March 1937. Nurserymen in the Philadelphia district have been able to ship large nursery stock to southern points almost continuously since last fall. Many early spring orders for perennial plants and small nursery stock were shipped from this area in March. Seven temporary inspectors were added to the New Jersey force to help with the rush of work attending the certification of 21 carloads of nursery stock. Approximately 250,000 asparagus roots were also certified for shipment from New Jersey. At one establishment the inspector found five Japanese beetle larvae in cavities in the asparagus roots. Quantities of rhododendrons and azaleas were treated with paradichlorobenzene, a method which is still increasing in favor with nurserymen desiring certification for these species.

Certificate of merit for Division's exhibit at St. Louis.--A certificate of merit was awarded to the Division for its comprehensive exhibit of divisional activities at the Greater St. Louis Flower Show, held in the St. Louis, Mo., arena, from March 26 to April 3. J. C. Silver, of the Bloomfield, N. J., field headquarters' staff, supervised the assembly of the exhibit at St. Louis and was in attendance during the 9 days of the exhibit to answer questions and distribute literature. He was assisted by O. K. Courtney, a representative of the Division, who is stationed at St. Louis.

Soil-conservation payments stimulate sale of fruit trees.--Orders for plants of small fruits and for fruit trees to be shipped from nurseries on the Eastern Shore of Maryland and Virginia have tripled this year, owing, it is reported, to the distribution of Government benefit payments to farmers.

Second offender fined $100.--On a plea of guilty to an information containing six counts, involving shipments lacking Japanese beetle certification extending over a period of 3 years, the proprietor of a nursery at Hammonton, N. J., was fined $100 in the United States District Court at Camden, N. J., on March 18. On May 28, 1928, this nurseryman pleaded guilty to an information involving one uncertified shipment. At that time he was fined $50. In imposing the $100 fine, the Court warned the nurseryman that in case of further convictions it would probably be necessary to add some confinement to the fine.

Bidivisional beetle exhibit at International Flower Show.--Valuable space on the first floor of Grand Central Palace, New York City, was assigned to the Bureau for a Japanese beetle exhibit at the International Flower Show, from March 14 to 19. Japanese beetle parasite material and control measures for Japanese and Asiatic beetles were the principal features of the half of the exhibit prepared by the Moorestown, N. J., laboratory of the Division of Fruit Insect Investigations. A miniature road-patrol station, scouting traps, and mounts depicting quarantine and suppression activities of the Division of Japanese Beetle Control comprised the remainder of the display. I. M. Hawley, of the Moorestown laboratory staff, and J. C. Silver, of the Bloomfield, N. J., field headquarters, were on hand to answer questions on all phases of the research and control work.

Road stations reopened on south-bound highways.--Road-patrol activities for 1938 started on March 24, with the opening of the station on U. S. Route 211 at Amissville, Va. The following day the important post on U. S. Route 1 at Fredericksburg, Va., was reopened. On March 26, the stations on State Routes 2 and 3 out of Fredericksburg were posted.

Strawberry-plant fumigation house completed.--A large strawberry-plant grower at Salisbury, Md., has completed construction of a fumigation house. The interior is lined with sheet metal, with seams made air-tight with calking material. The house is equipped with a large-capacity power blower for circulating the gas in the chamber and exhausting the gas when the ventilators are open. The floor of the house has been lined with steam pipes to be used when it is necessary to raise the temperature to 60° F., the minimum temperature to be maintained during the fumigation period. No commercial fumigations have been performed as yet, but extensive tests and research have been carried on with methyl bromide under the direction of the Division of Control Investigations.

Infested shipments.--Eleven shipments from which gypsy moth egg clusters were removed were offered for inspection and certification during the month. The most heavily infested shipment was a carload of lumber inspected at Deering Junction, Maine, prior to movement to North Tonawanda, N. Y. Fourteen egg clusters were taken from this lumber.

Dutch elm disease personnel increases.--An additional allotment of W. P. A. funds made in March permitted restoration to the payroll of some of the crew members dismissed at the end of the February work period. By the end of the month the number of men on security wages in the respective States was 126 in Connecticut, 1,108 in New Jersey, 249 in New York, and 13 in Indiana.

Two more confirmations in Indianapolis.--Two additional trees infected with the Dutch elm disease have been found in the Indianapolis, Ind., area. One was in Crown Hill Cemetery and the other on Chapel Road, in Washington Township. This brings the total number of confirmed cases at this isolated infection to 67.

FOREST INSECT INVESTIGATIONS

Larval mortality for elm bark beetle.--C. H. Hoffmann, of the Morristown, N. J., laboratory, reports that a total of 28 square feet of bark from five heavily infested elm trees was examined in March to determine larval mortality for the smaller European elm bark beetle (*Scolytus multistriatus* Marsh.). Counts were made of all larval mines and all living larvae. These showed that of 19,934 larvae that had once been present, only 2,390 remained alive. The total larval mortality due to crowding, bark and wood condition, woodpecker feeding, and other factors amounted therefore to 88 percent. There were approximately 16 brood burrows per square foot of bark examined.

Records on spruce sawfly cocoons.--H. J. MacAloney, of the New Haven, Conn., laboratory, reports that square-foot samples of duff and litter containing cocoons of the European spruce sawfly were taken at 50-foot intervals along two compass lines run for approximately half a mile up the north slope of Mount Monadnock, at Dublin, N. H., in October 1937, the number of samples totaling 86. Each sample was placed in a canvas bag and the entire lot was delivered to J. G. Conklin, of the University of New Hampshire, who held them in cold storage. Counts during the winter showed a total of 5,650 cocoons, or an average of about 65 per square foot. These were divided as follows, on a square foot basis: Adult sawflies had previously emerged from 20 (apparently from 19 in 1937, and from 1 prior to that time); 12 destroyed by mammals; and 3 destroyed by predatory insects; while the remaining 30 cocoons, about 45 percent of the total, were considered as sound and still containing insects. Since removing the samples from cold storage, a high percentage of the sound cocoons have produced female sawflies but no males have been obtained and as yet no parasites have issued. Another collection of 86 samples will be taken from the same points this spring, just before the sawflies emerge, to obtain further information on destruction by mammals. It is believed that there will have been no appreciable winter mortality, as weather records taken in this area indicate a relatively mild winter.

Propagation of spruce sawfly parasite.--P. B. Dowden and P. A. Berry, New Haven, report that large-scale propagation of *Microplectron fuscipennis* Zett., a cocoon parasite of the European spruce sawfly, is now under way. To aid in this work the Society for the Protection of New Hampshire Forests, through a cooperative agreement with the United States Department of Agriculture, has furnished an assistant, Frank E. Miller, Jr., who reported for duty on March 1.

Insect hazard inventoried in California.--The forest insect hazard on 563,000 acres of pine timberland in the Lassen area of California was inventoried by a field crew during the 1937 field season, according to P. C. Johnson, of the Berkeley, Calif., laboratory, using methods previously developed to measure past loss and present stand susceptibility to bark-beetle attacks. A complete working circle which supplies the raw materials for a sawmill of large capacity was included in the area inventoried. A hazard greater than moderate exists throughout the area. By locating and mapping the areas of different degrees of hazard and by measuring the resources in each, a basis has been provided for direct application of the results in forest management and utilization plans.

Susceptibility classification applied on Black's Mountain Experimental Forest.--J. W. Bongberg, Berkeley, reports that tentative classification of the susceptibility of ponderosa and Jeffrey pine trees was applied on the Black's Mountain Experimental Forest in California, in 1937. Crown characters, indicating the presence of California flatheaded borer broods, were used to identify susceptible trees. A total of 18,712 trees on 1,040 acres were rated in four susceptibility classes. Susceptible trees averaged, by volume, 15.5 percent of the total green stand. They were found to represent an approximate average of stand values. Analysis of 480 trees, totaling 625,570 feet b.m. that were cut from 249 acres after having been classified as highly susceptible, showed that between 80 and 90 percent contained incipient flathead borer broods and were classified correctly.

Food habits of *Enoclerus sphegeus* (F.) and *Temnochila virescens* (F.).--Fly larvae as a diet for young larvae of *Enoclerus sphegeus*, an important predator of the mountain pine beetle, have proved to be unsatisfactory in tests conducted at the Berkeley, Calif., laboratory, according to G. R. Struble. On the other hand, *Temnochila virescens*, another important predator of the mountain pine beetle, feeds readily and develops rapidly on larvae of the fly *Lucilia sericata* Meig., when provided as an artificial diet. This would indicate that *E. sphegeus* is more specific in host-selection habits than is *T. virescens*.

Technique developed for procuring eggs of predators.--Procurement of eggs in abundance, of two important coleopterous predators of the mountain pine beetle in sugar pine, has been demonstrated by Mr. Struble. This is an important step in the development of technique for biological control. Controlled tests conducted on the oviposition habits and reproductive potential of *Temnochila virescens* and *Enoclerus sphegeus* have resulted in large numbers of eggs, following the provision of propo stimuli. The conditions necessary are: (1) The use of mated pairs, each pair enclosed in a separate container (small glass jar or petri dish); (2) a small, green sugar pine block containing bark and phloem; (3) a supply of *Dendroctonus* adults, which attack the blocks and serve as food for the predators. A continuous supply of eggs has been assured by setting up fresh green blocks each week. At the end of the week eggs are removed from the blocks and placed in petri dishes, where they hatch out within 4 to 6 days. Fertility of eggs collected thus far has been nearly 100 percent.

Nature affords protection of newly hatched predators against cannibalism.--Among newly hatched larvae of *Temnochila virescens* and *Enoclerus sphegeus* cannibalism is absent. Observations by Mr. Struble on many egg masses have led to this belief. The stored-food material from the egg stage enables the young larvae to go without eating for several days, during which time they wander away from the egg masses and rarely molest them. In later stages the voracious appetites of growing larvae impel them to feed indiscriminately on whatever larval life moves, including their own kind.

Bark-beetle control work successful in southern California recreational areas.--During the fall of 1937 a forest-insect survey of the summer-home and resort areas in the southern California forests was initiated by the Berkeley laboratory. This work was directed by J. E. Patterson and included coverage of about 250,000 acres and the establishment of 12 permanent sample plots. The purpose of this survey is to keep numerous organizations, interested in protection of the forest cover on these areas, informed regarding current insect infestations and needs for control work. Conditions found in the fall of 1937 indicated that bark-beetle infestations were at a low status and only a minor amount of control work was recommended for the winter control season. The Idyllwild Project, in Riverside County, where control was carried out by private and federal agencies during the winter of 1936-37, has shown excellent results.

Type of host material important in bark-beetle infestation.--W. D. Bedard, of the Coeur d'Alene, Idaho, laboratory, in reporting on the results of an intensive study of an infestation of the mountain pine beetle in the western white pine stands of the Coeur d'Alene National Forest, points out that the abundance of beetle broods varies in the different types of white pine host material attacked by the insect. The 2 years of data available at the present time indicate that debris from road construction, logging slash and cull logs, and fire-scorched trees, although potentially capable of abundant broods, are unfavorable for development and do not threaten as sources of mountain pine beetle infestation. Most of the available bark surface in these materials is utilized by secondary bark beetles and wood borers. Mountain pine beetle broods in windfalls, on the other hand, are almost as abundant as those in standing trees, even though there are nearly three times as many attacks in the standing trees. Trees infected with root rots appear to be slightly preferred by the mountain pine beetle over uninfected trees. The diseased trees are found mainly on drier, poorer sites, are attacked with approximately the same density as uninfected trees, and are capable of producing approximately the same volume of new beetles per square foot.

Unseasonably warm winter temperatures contribute to bark-beetle mortality.--Tests conducted at the Coeur d'Alene laboratory indicate that the occurrence of abnormally warm temperatures during winter months, when mountain pine beetle larvae are normally inactive, may contribute to subsequent brood mortality. J. C. Evenden reports that larvae that withstood an exposure of -25° F. were far less resistant after being exposed to abnormally warm temperatures. The reduction in larval resistance to low temperatures was in rather direct proportion to the duration and severity of the exposure to warm temperatures. These tests furthermore demonstrated that when larval resistance had once been reduced it could not be rebuilt to the same degree as previously existed.

Relation of cold-hardiness of Black Hills beetle to locality.--Ponderosa pine infested with the Black Hills beetle was collected by N. D. Wygant, of the Fort Collins, Colo., laboratory, from four localities in January and February to determine whether or not the cold-hardiness of the insect varied over its natural distribution. The infested logs were brought to Fort Collins by truck and the larvae were tested immediately in a cabinet with controlled temperatures. One hundred of the insects were exposed to the cold for 2 hours and 15 minutes as naked larvae in petri dishes at intervals of 2.5° F. over the critical range. The locality, name of national forest, date tested, and critical range of each were as follows: Pine Lake, in southern Utah, Powell N. F., Jan. 26, -17.5° to -32.5°; South Fork, in southern Colorado, Rio Grande N. F., Feb. 9, -15° to -32.5°; Custer, S. Dak., Harney N.F., Feb. 25, -22.5° to -35°; and Roosevelt N.F., in northern Colorado, Jan. 26 and Feb. 9, -20° to -32.5°. The critical ranges from the various localities were very nearly the same, except that the larvae from the Black Hills of South Dakota were a little more cold-hardy than all the others, and the larvae from northern Colorado were slightly more hardy than those from southern Colorado and southern Utah. The tests were made in midwinter, when the larvae reach their maximum cold-hardiness. Their fall and spring hardiness would no doubt vary in proportion to the local seasonal temperatures.

Orthodichlorobenzene-naphthalene emulsion fairly effective against larvae of flatheaded apple-tree borer.--Of the various chemicals tested against larvae of Chrysobothris femorata Oliv. under the bark of American elm at Lincoln, Nebr., in August 1937 by N. D. Wygant, of the Fort Collins, Colo., laboratory, an emulsion of orthodichlorobenzene and naphthalene gave the best results, killing 92 percent of the young larvae in the trees sprayed on August 3. A stock emulsion was made up of 2 quarts of orthodichlorobenzene in which was dissolved 2 pounds of flake naphthalene, 24 ounces of water, and 8 ounces of potash fish oil soap. One part of the stock was diluted with 2 parts of water, which gave a spray of approximately 16-2/3 percent orthodichlorobenzene and 8-1/3 percent naphthlene. The emulsion was sprayed on the bark of the infested trees until the liquid began to run down the crevices of the bark. A week later the sprayed trees were cut, the bark peeled off, and the mortality of the larvae counted. The sprays applied on August 14, after the larvae were larger, were not as effective as those applied on August 3.

GYPSY MOTH AND BROWN-TAIL MOTH CONTROL

Cleaning work at infestations speeds up subsequent scouting.--Most types of gypsy moth work require skilled men, but efficient cleaning work in the immediate vicinity of infestations can be done by unskilled laborers. This work, which includes picking up, examining, and burning dead wood and debris, not only improves the forests and reduces the gypsy moth population, but also is of material benefit to scouting and treatment work subsequently performed in the cleaned areas.

Gypsy moth work only slightly delayed by maple-sugar season.--Gypsy moth work is often retarded in some sections by the resignation of many W. P. A. employees to accept other work of a seasonal nature, such as harvesting crops. Most interruptions of this sort occur in the fall, but the maple-sugar crop is a very important exception. The season begins early in the spring, when the sap starts to flow in the trees, and continues for an indeterminate period depending on the favorableness of the weather. Several W. P. A. workers assigned to gypsy moth work in Vermont and western Massachusetts obtained temporary employment in March in tapping maple-sugar trees, gathering sap, and assisting in the manufacture of maple sirup and maple-sugar products. Gypsy moth work in that section was not seriously delayed, as the unseasonably warm temperatures during the month shortened the maple-sugar season and caused a subnormal yield of sap.

Access to isolated territory facilitated by new lumbering roads.--Much gypsy moth work is performed in wild mountainous country, where the woodland blocks extend over thousands of acres, and some sections can be reached only on foot. The eastern portion of Sunderland, in the southern part of the Vermont section of the barrier zone, is a typical example of such country. Formerly it could only be reached by walking over trails and old abandoned wood roads, many of which were partially filled with brush and were difficult to follow. However, a concern engaged in hauling pulpwood from a large woodland area in this territory has recently constructed a main road into the block and side roads to the different sections, capable of supporting heavy-duty trucks. The new roads are of great assistance to the gypsy moth scouts, who started work in Sunderland the latter part of March.

New industry consumes gypsy moth food plants.--In West Stockbridge, in the Massachusetts section of the barrier zone, a lumberman has developed a market for poplar lumber. He is cutting a large quantity of poplar growth into 12-foot lengths, sawing the logs into boards and planks of various thicknesses, and shipping them to Hazardville, Conn., where they are used in the manufacture of radio cabinets and inexpensive furniture. Formerly, poplar lumber was considered unsuitable for such uses. As poplar is one of the most favored food plants of the gypsy moth, the removal of such a large quantity will be of material assistance to the control work in that section.

Brush pulverized at infestation where burning would be dangerous.--The sawdust machine purchased by this activity some time ago is at present being used to dispose of brush accumulated from gypsy moth thinning work in Hampshire County, Mass. The machine reduces the brush to sawdust and can either blow the sawdust into a pile or broadcast it over a considerable area. It is particularly useful in locations where the burning of the brush would endanger the surrounding territory, as is the case at the infestation where the machine is now working. An abundance of tall dry grass and weeds in the area where the brush is piled could easily become ignited if the brush were burned, and serious damage might result.

Spraying needed in area where egg clusters were broken by ice storms.--A large percentage of the egg clusters in northwestern Connecticut were broken by ice storms during the winter months and the disturbed portions of the clusters dropped to the ground and were lost among the leaves. In such cases even the raking up and burning of the leaves would not destroy all of the eggs. Many small portions of egg clusters and individual eggs would escape, despite the most careful work, and subsequent spraying of the foliage is the only reliable remedy in such circumstances.

Municipal thinning work helps eradication campaign against gypsy moth.--The city of Waterbury, Conn., recently began cleaning and thinning operations on their waterworks property in the town of Warren, which is in a part of the barrier zone that is most susceptible to gypsy moth infestation. The Federal forces have found it necessary to work in this town annually for the last several years in order to keep the barrier zone free of the pest. The work by the city of Waterbury automatically assists the gypsy moth eradication campaign, as it reduces both the quantity of food plants in the region and the material that must be examined by the Federal scouts.

Gypsy moth work benefits from real estate development.--A real estate syndicate has recently purchased many of the vacant farms in Sherman, Fairfield County, Conn., and is constructing lodges of field stone and planting pines and spruces in many of the unforested areas. As Sherman is adjacent to the New York State line in the Connecticut section of the barrier zone, gypsy moth work in that section will be benefited in two respects: The amount of field stone that would have to be examined in case gypsy moth infestations should be found in the vicinity will be materially reduced, and the solid stands of coniferous growth will be practically immune to damage by the gypsy moth.

Shipments of nursery stock increasing rapidly.--A government inspector stationed on Long Island, N. Y., to examine materials likely to harbor the gypsy moth before shipment from the regulated area in Nassau County, reports a large increase in the movement of nursery stock from that area. The volume of inspection work practically doubled during the last week in March. Similar conditions are reported from Pennsylvania, where there has been a material increase in the shipments of rhododendron and kalmia shrubs, especially from the woodland areas in the region of the Pocono Mountains. It has been possible this year to dig the plants at least 2 weeks earlier than usual, which is of decided advantage to the operators because of an unexpectedly large increase in business. The operators have already received orders for more rhododendron and kalmia plants than were sold during the entire season in any of the last 10 years. All of the plants that originate within the quarantined area must be inspected for the gypsy moth before they are shipped. Large quantities of selected ash logs were inspected in the vicinity of Moscow, Pa., during the last week in March. The logs are to receive special treatment and will then be shipped to a large manufacturer of baseball bats in Louisville, Ky.

Progress of gypsy moth work in Pennsylvania.--During the period July 1, 1937, to February 28, 1938, more than 203,000 acres of woodland and open country were scouted in the Pennsylvania area and 217 infestations, totaling nearly 190,000 egg clusters, were located and destroyed. Approximately 50 percent of the infestations and more than 70 percent of the egg clusters were found in Luzerne County.

Shipments increase in Pennsylvania quarantined area.--During the first half of March a total of 1,254 shipments were inspected and certified, and 1,927 shipments were allowed to move under permit in the Pennsylvania area under quarantine on account of the gypsy moth. The bulk of the shipments consisted of field stone for highway construction work; mine props and lagging; and junk metal, much of which was exported. The shipments were all made in compliance with the new quarantine regulations promulgated by the Pennsylvania department of agriculture, which became effective on February 15.

Large white oaks on high elevation removed by C. C. C.--The plan of work to be done by C. C. C. enrollees assigned to gypsy moth work has been revised so that special emphasis can be placed on the treatment of infestations that especially threaten the barrier zone, before the emergence of the caterpillars. In accordance with this policy, 131 large white oak trees on a high elevation in Russell, Mass., which were badly infested with the gypsy moth, have been removed. The trees ranged from 10 to 30 inches in diameter, measured breast high. It required approximately 2½ man-days per tree to take them down, cut them into 8- or 12-foot sections, and clean up and burn the slash. As Russell is only one town removed from the eastern border of the barrier zone, and as the infested trees were so situated that there was serious danger of wind spread toward the zone, their removal should be of direct benefit to the zonal work. Late in March several W. P. A. employees were assigned to work in sections of this heavily infested area that could not be covered by the C. C. C. men before the beginning of the spraying season.

PLANT DISEASE CONTROL

Barberry eradication in Illinois.--In making an analysis of control work conducted in two cities, more or less typical of those found in northern Illinois, R. W. Bills, in charge of barberry eradication in that State, has compiled the following data. Some work was done in each of these cities during each year indicated in the following table. Each successive survey has been more thorough than the previous one.

Year	Infested properties		Bushes destroyed	
	Belvidere	Rockford	Belvidere	Rockford
	Number	Number	Number	Number
1918-----	?	?	2,350	1,962
1919-----	9	480	21	2,116
1923-----	3	65	22	143
1926-----	17	65	46	150
1937-----	3	27	3	42
Total	32 +	637+	2,442	4,413

The number of bushes found in 1937, as compared with the total number found in each city, is extremely small and it appears that the problem of complete eradication in these cities is practically solved. Mr. Bills reports further that only one area infested with Berberis canadensis is known to exist in Illinois. This is located along the Illinois River in Tazewell County. The area was first reported in 1924. Existing bushes were destroyed in 1924, 1933, and in 1937. More than 59,000 bushes were destroyed in 1924, 9,450 in 1933, and 3,690 in 1937. Not only were fewer bushes found in 1937 but the individual bushes were much smaller, many of them less than 6 inches high. It is believed that only one more detailed inspection of this area will be needed to bring about complete control. The area extends for about 2½ miles along the bluffs of the river and so far as can be determined it has not increased in size since it was first discovered.

Barberry eradication in South Dakota.--In a recent report summarizing progress that has been made in barberry eradication in South Dakota since 1933, George W. Eade, State leader in charge, submits the following data: Certain areas in 21 counties, where there was evidence that barberry bushes might exist, have been given a detailed inspection and bushes have been found on 97 new properties and on 35 properties reported prior to 1933. As a result of this work 1,365 bushes have been destroyed, bringing the total number eradicated in South Dakota since control was first undertaken to 135,872. Mr. Eade reports further that of the 97 new properties located in these counties, all but 1 were found within a radius of 2 miles of properties on which bushes were known to exist or had been destroyed by work completed prior to the time this intensive survey was made.

Scouting for blister rust in the sugar pine region in 1937.--The principal objective of the scouting work in California in 1937 was to ascertain the southward spread of white pine blister rust in the State along the Coast Range and the Sierra Nevada. An intensive search for fruiting pine cankers was made in the vicinity of all infections found on Ribes. Blister rust infections were found in the Coast Range on the southern end of the Trinity National Forest, approximately 125 miles south of the Oregon border. This discovery marked an advance in the known spread of the disease of 100 miles in one season. In the Sierra Nevada, scouting parties identified blister rust on infected Ribes for the first time. The discovery was made on Ribes roezli in Tehama County on the Lassen National Forest, also 125 miles south of the Oregon border. The prevalence of infected Ribes indicates that blister rust spores were dispersed widely over southern Oregon and

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northern California during the spring of 1937. Although the source of these spores is not definitely known, it is probable that, owing to their general distribution, they came from a considerable distance to the north. The exposure of white and sugar pine in this area to blister rust infection in 1937 will result in centers of infection on these trees that will become visible in 1939 and following which a further spread and intensification of the disease may be expected. The results of the scouting work done in 1937 in this region are shown below. The host plants examined include all species of Ribes in this region and two species of pine--Pinus monticola and P. lambertiana.

State	Host plants examined	Host plants found infected	
	Number	Number	Percent
California--	82,165	223	0.27
Oregon------	1,449	257	17.74
Total--	83,614	480	.57

Winter camp operated with relief labor.--On December 1, 1937, a work camp was opened at Mariposa, Calif., and manned with 65 selected men from the blister rust control operations in the sugar pine region of California. The camp was comfortably housed in semipermanent buildings formerly occupied by a C. C. C. camp. The elevation at this point is 2,000 feet, which is above the fog belt and just below the winter snow line, permitting ideal working conditions. The purpose of the camp was to overhaul and repair the equipment used in blister rust control operations. One of the major activities during the winter was the laundering and stenciling of 5,000 wool blankets, 1,200 sleeping-bag covers, 1,200 sleeping-bag sheets, 800 mattress covers, and 100 canvas tarpaulins. Several hundred cots and tents were repaired and all pick-mattocks, saws, and axes were sharpened. In addition to providing jobs for needy persons in compliance with W. P. A. regulations, very satisfactory work was accomplished and trained men were held over the winter in readiness for the opening of the field season in the spring. One of the major problems faced by the blister rust control office in the sugar pine region has been that of obtaining an adequate supply of men qualified to fill the important positions of field foremen, clerks, and crew leaders. This problem is directly traceable to the seasonal character of the work and is one that requires considerable training of new men at the beginning of the field season. By carefully selecting the men for this winter camp, it was possible to retain the best of the trained men, thereby facilitating the opening of camps in the spring.

COTTON INSECT INVESTIGATIONS

Studies of long-cycle pink bollworm larvae in Puerto Rico.--The behavior of the larval stage of the pink bollworm was studied by L. C. Fife, Mayaguez, P. R., in relation to definite changes in the environmental complex over a period of years, in order to determine the factor or factors that induce the development of long-cycle larvae. He found that the resting stage was always abundant in the fields during long periods of drought, regardless of the age of the crop or time of the year at which this takes place. However, regardless of the amount of rainfall, a small percentage of long-cycle larvae always occurs, indicating the existence of an inherited seasonal cycle which cannot be broken within several generations. The reaction of larvae to artificial drought conditions in the laboratory was also studied, in order to aid in the interpretation of the effect of the environmental complex in the field. Cotton plants were grown in 176 5-gallon oilcans filled with sandy-loam soil. About 25 days after date of planting the plants were divided into two lots and treated as follows: In the dry series the amount of water supplied to the plants was so regulated as to cause a severe water-stressed condition, the plants shedding most of their leaves and fruiting forms. In the wet series the plants were given an abundant supply of water. The plants in this series were vigorous and healthy, bearing many fruiting forms per plant. Blooms on all plants were tagged daily so that the age of the bolls would be known. About 45 days after date of planting first-instar larvae were installed on all bolls regardless of age, and 15 days after date of installation the bolls were collected, the larvae removed, and classified according to age. The percentage of long-cycle larvae was determined from each series of different age groups. The moisture content of the seed and lint from bolls of various ages was also determined from each series. It was found that the moisture content of the seed and lint of the bolls grown on cotton plants suffering from water deficiency was always lower than that of the seed and lint of bolls grown on plants receiving an abundant supply of water, the averages being 38.3 and 52.9 percent, respectively. These determinations were made 25 days after the treatments were started. The percentages of long-cycle larvae from the bolls of the dry series were always higher than the percentages of resting larvae from bolls of the wet series, the averages being 86.4 and 57.1 percent, respectively. In order to supplement the above experiment, the percentage of long-cycle larvae that develops in various types of fruiting forms under field conditions was also determined. Four types of fruiting forms, namely, young green bolls (soft), old green bolls (hard), young dry bolls (dead but hanging on the plant), and open bolls, were used in these studies. The results are shown in the following table.

Type of fruiting form	Records	Long-cycle larvae
	Number	Percent
Young green bolls (soft)	95	66.3
Old green bolls (hard)	412	75.7
Young dry bolls	195	79.5
Open bolls	340	92.4

It is obvious that the highest percentage of long-cycle larvae occurred in the older fruiting forms, i. e., bolls containing the least moisture. In another test young (soft) and old (hard) green bolls were collected in the field. The percentage of long-cycle larvae and the moisture content of the seed and lint in each type of boll were as follows:

Type of fruiting form	Records	Long-cycle larvae	Moisture content of seed and lint
	Number	Percent	Percent
Young green bolls (soft)---	143	11.2	81.6
Old green bolls (hard)-----	114	26.3	71.9

It will be noted that the highest percentage of long-cycle larvae was found in the bolls containing the lowest moisture content. These field tests confirm the results of laboratory studies, that lack of moisture in the insects' food induces the development of the long-cycle phase. Under laboratory conditions the coefficient of correlation between the moisture content of the seed and lint in green bolls and age of the boll was -0.958 ± 0.009. The moisture content of the seed and lint of cotton bolls was inversely proportional to the percentage of long-cycle larvae, the coefficient of correlation being -0.552 ± 0.169. Correlation studies also showed that a higher percentage of larvae was found in the older bolls, the coefficient being ± 0.554 ± 0.177. These studies indicate that the resting stage is found in greater abundance in the older bolls, not because of age but because they contain less moisture. In order to determine the effects of temperature and moisture acting together in causing the development of the long-cycle stage, numerous short-cycle larvae were placed in desiccators where constant relative humidities of from 1 to 100 percent were maintained at various high temperatures. The highest percentages of long-cycle larvae were found in treatments maintained at the lowest humidities, this being especially true at the higher temperatures. Very few long-cycle larvae were found in treatments maintained at 90 or 100 percent relative humidity, regardless of the temperature. These results indicate that low humidity and high temperature reduce the water content of the larva itself by evaporation, thereby decreasing the rate of metabolism, with consequent cessation of development. Since the development of long-cycle larvae is induced by dry food and that of short-cycle larvae is induced by moist food, it was deemed important to determine the moisture content of these two types of larvae. This was accomplished by drying the larvae in an oven at 215° F. for 48 hours. The results are shown in the following table.

Type of larvae	Samples[1]	Moisture content		
		Average	Maximum	Minimum
	Number	Percent	Percent	Percent
Short-cycle--	1	70.8	--	--
Long-cycle---	11	62.9 ± 0.46	65.4	60.8

[1] Samples contained 25 or more larvae each.

It will be noted that the moisture content of short-cycle larvae averaged 7.9 percent higher than that of long-cycle larvae. This condition was probably caused by the difference in the moisture content of their food. From the above studies it seems reasonable to conclude that the development of long-cycle larvae is caused by any factor or factors that reduce the water content of the larvae themselves. Also, as a small percentage of long-cycle larvae are encountered, even under apparently favorable environmental conditions, the existence of an inherited long-cycle phase must be acknowledged.

PINK BOLLWORM AND THURBERIA WEEVIL CONTROL

Inspection.--Laboratory inspection at San Antonio has been negative during the month. Some of the green bolls inspected were collected from the top crop last fall in counties adjacent to the lower Rio Grande Valley of Texas, and about 1½ months after gin-trash inspection was completed. It therefore seems that if infestation had spread to these adjacent counties it would have shown up in the late bolls. As regulatory activities have been decreasing, the inspection of green-boll samples is also being carried on at some of the field stations. Bolls originating in Dona Ana County, N. Mex., were negative so far as actual specimens were concerned; however, one exit hole was found. In bolls from Luna County, N. Mex., seven specimens of the pink bollworm were found and 3 were found in bolls from El Paso County, Tex. From the heavily infested part of Hudspeth County, Tex., 2,000 bolls were inspected and 1,252 specimens of the pink bollworm were found, while the same number of bolls from the lightly infested part of the county contained only 58 specimens. Since the finding of a pink bollworm larva in Thurberia bolls in the Rincon Mountains of Arizona additional bolls are being collected from various mountain ranges adjacent to the Santa Cruz Valley. By the close of the month some 43,000 bolls from 3 ranges had been collected, placed in the proper preservative solution, and sent to El Paso, Tex., for inspection. Collections will be made in the remaining ranges as rapidly as possible.

Wild-cotton eradication.--The eradication of wild cotton in southern Florida has continued to go forward satisfactorily. A few days' work was lost at Cape Sable the latter part of the month because of rain. Even so, a considerable part of the area was cleaned for a second time. One section required only 4 days for a second cleaning, as compared to 6 days for the first cleaning, as the men could follow old trails. Consequently, during this second recleaning excellent guide trails are being cut all over the area and should result in a considerable time saving in future. The crew, which has been camped in the Everglades and Ten Thousand Islands, has made good progress and has removed a considerable number of plants. In the Fort Myers section a third recleaning was begun the latter part of the month. Many old colonies were visited without finding any cotton. At Indian Field only 45 seedlings were found, whereas this location usually contains more seedlings than any other section. A fairly large virgin plant was located and removed in the Goodland Point section. It had two limbs extending at least 25 feet from the trunk and containing a great many mature bolls. During this third cleaning considerable scouting of suspicious areas is being carried on. On the mainland keys a second cleaning is in progress, with a number of sections already completed. This season has been exceptionally dry in practically all of the wild cotton territory. This has resulted in many of the small seedlings making very slow growth, and naturally they are much harder to locate. Over 6,500 acres were covered in March, from which 174,691 seedling and 1,248 sprout plants were removed. Of this number 11,659 contained mature bolls. Approximately 3,000 additional acres were scouted without finding any wild cotton.

Thurberia-plant eradication.--The eradication of Thurberia plants in the Santa Catalina Mountains has gone forward satisfactorily. During the month a little over 500 man-days was put in and, from the 2,120 acres covered, 7,634 Thurberia plants were destroyed. Most of the area covered was very rough. The laborers have been transported to and from Tucson each day while the new camp is being erected. Everything will be in readiness to carry on work directly from camp early next month.

TRUCK CROP AND GARDEN INSECT INVESTIGATIONS

Peanut-oil emulsion added to derris-dust mixture aids in pea aphid control.--In an extensive series of greenhouse tests with several combinations of derris-dust mixtures against *Illinoia pisi* (Kltb.), T. E. Bronson and P. V. Stone, of the Madison, Wis., laboratory, found that a derris-dust mixture containing 0.4 percent rotenone, with talc as the diluent and conditioned with sodium oleyl sulphate as a wetter and spreader (1 percent), plus a crude peanut-oil emulsion (2 percent), gave a satisfactory mortality of the pea aphid through all the ranges of relative humidity from 20 to 85 percent. The application of derris-dust mixtures that did not contain any conditioning materials resulted in a low mortality of the pea aphid at all the ranges of relative humidity encountered. The application of derris-dust mixtures containing sodium oleyl sulphate (1 percent) as a wetter and spreading agent, but without crude peanut-oil emulsion, gave a low mortality of the pea aphid at low relative humidity and a satisfactory mortality of the test insects after the expiration of 4 days when the relative humidity was 50 percent or higher. It was concluded, on the basis of these tests in the greenhouse, that derris-dust mixtures containing the sodium oleyl sulphate as a wetter and spreader were decidedly superior in toxicity to the pea aphid than a dust mixture not containing this ingredient, whereas the dust mixture containing this same wetter and spreading agent, plus a crude peanut-oil emulsion, was greatly superior to the dust mixture that did not contain this vegetable oil. These results corroborate previously reported findings of N. F. Howard and H. A. Fulton, of the Columbus, Ohio, laboratory, that when emulsions of peanut oil are added to sprays or dust mixtures, their efficiency is increased greatly against large plant bugs. If the results of these tests in the greenhouse are borne out under field conditions, it may be possible to greatly increase the effectiveness of dust mixtures containing rotenone for use against the pea aphid by the addition of peanut-oil emulsion, as thus far many field experiments against this insect have shown variable results in the presence of different humidities.

Tomato fruitworm hibernates successfully in Utah.--H. E. Dorst, of the Logan, Utah, laboratory, reports that an examination of cages simulating natural conditions containing pupae of *Heliothis obsoleta* F., which pupated normally at Hooper, Utah, in the fall of 1937, indicate that approximately 65 percent of the pupae had survived to the close of March 1938. It was found that on an average these pupae were present at a depth of 3.4 inches below the level of the soil surface. Examinations of soil in cornfields where the pupal population was determined at approximately 0.15 per square foot in the fall of 1937 showed that approximately 50 percent of the pupae survived the winter and that the depth of pupation in the cornfields was similar to that observed in the overwintering cages. The mortality of the tomato fruitworm, as observed in overwintering cages during the winter of 1936-37, was 100 percent. No survival of overwintering pupae was observed in cornfields or tomato fields in the spring of 1937.

Cabbage worms controlled on fall-grown cabbage in South Carolina.--In summarizing the results obtained in insecticide tests directed against cabbage worms on cabbage grown at Charleston, S. C., during the fall and winter of 1937-38, W. J. Reid, Jr., reports that a cabbage worm population consisting of the cabbage looper (Autographa brassicae Riley) and various Agrotinae principally the corn ear worm and several species of climbing cutworms) can be controlled effectively by the use of a calcium arsenate-hydrated lime dust mixture (3-1) prior to the heading of the plants, followed by applications of a pyrethrum-talc-dust mixture containing 0.3 percent total pyrethrins, or a derris-clay-dust mixture containing 1.0 percent rotenone, at 10-day intervals after the plants have headed, provided the plants had been well protected against cabbage worms before being thinned or transplanted. During the progress of these experiments the cabbage worm populations were held to a relatively low point by early frosts and general low temperatures; consequently, the populations did not exceed a maximum of 87.5 per 100 plants. These populations evidently were not sufficient to cause marked injury to the plants, as the final observations showed that only about 4 percent of the plants not treated with insecticides were considered unmarketable as U. S. Grade No. 1, because of worm damage. While no significant differences were demonstrated between U. S. Grade No. 1 yields of the various treatments, highly significant correlations were shown to exist between the numbers of worms and the numbers of worm-damaged plants and, in the reverse ratio, with the numbers of plants free of worm injury. It was shown that if the numbers of worms were reduced by the insecticides, the numbers of injury-free plants were increased and the numbers of worm-damaged plants were decreased. The experiment demonstrated that the pyrethrum-dust mixture and the derris-dust mixture were most effective against the cabbage looper and that the calcium arsenate-dust mixture was most effective against the Agrotinae.

Chloropicrin unsatisfactory as a fumigant for cigarette beetle.--W. D. Reed, of the Richmond, Va., laboratory, reports that the results of a recent fumigation experiment with chloropicrin at atmospheric pressure demonstrated that this fumigant was not effective against larvae of Lasioderma serricorne F., and that the residual properties of this fumigant were such that it was retained in the fumigated bales for a long period of time, complicating the handling of the fumigated tobacco in storage. The experiment was performed in a fumigating chamber 25½ by 27 by 9 feet, filled with Puerto Rican cigar tobacco in bales of relatively low density, each of which weighed approximately

158 pounds. A dosage of 2 pounds of liquid chloropicrin was applied for each 1,000 cubic feet of space, for an exposure period of 47 hours. The temperature of the tobacco at the beginning of the exposure was 58° F. and the room temperature was 57°. Some test lots of well-grown larvae of the cigarette beetle placed in the bales of tobacco at the top and bottom levels indicated that no appreciable toxicity to the insects was obtained at this dosage and exposure period. Owing to pronounced irritating effects on the eyes, the 278 bales involved in this fumigation test could not be removed from the chamber until the 11th day following the end of the exposure period, although during this interval the ventilating system was operated for 44½ hours.

Effectiveness of poisoned-bran bait against green June beetle larvae in tobacco plant beds.--Norman Allen, of the Florence, S. C., laboratory, reports that, in tests conducted in February, a poisoned-bran bait consisting of 1 pound of paris green to 25 pounds of wheat bran, applied broadcast to a tobacco plant bed infested by larvae of *Cotinus nitida* (L.), resulted in an apparent reduction of approximately 88 percent in the number of new burrows of this pest after the expiration of 72 hours. The plant bed under observation, covering an area of slightly less than 800 square yards, was found to have 717 burrows prior to the application of the poisoned bait and only 87 after the bait had been applied. Some of the tobacco growers obtained satisfactory control of the green June beetle larvae by applying this bait only around the burrows. Indications were that injury by this pest was confined to old plant bed sites and such injury could have been avoided by the selection of new bed sites. It was not possible to determine the number of dead grubs because such a procedure would have necessitated the digging up of the plant bed.

Relative suitability of various plants as overwintering hosts of beet leafhopper.--O. A. Hills and M. F. Bowen, of the Grand Junction, Colo., laboratory, report that the hibernation cages placed over various host plants of *Eutettix tenellus* Bak. last fall, to determine the relative suitability of such plants as overwintering hosts for the insect, were examined in March, with the following results: The plants tested in order of suitability indicated were: *Norta altissima*, *Lepidium* sp., *Cheirinia repanda*, *Gutierrezia microcephala*, *Dondia* sp., *Artemesia tridentata*, *Atriplex corrugata*, *Atriplex confertifolia*, *Juniperus utahensis*. The first three mentioned are fall-germinated mustards and survival ranged from about 40 to 46 percent. The other six are perennials. Survival on *Gutierrezia*, *Dondia*, and *Artemesia* ranged from about 26 to 30 percent. The mean survival on the *Atriplex* spp. was about 11 percent, and no leafhoppers were recovered from the juniper.

Feeding and oviposition responses of sweetpotato weevil adults.--As a result of experiments to determine the feeding and oviposition responses of the adults of *Cylas formicarius* (L.), K. L. Cockerham, of the Sunset, La., laboratory, reports that when the weevil adults were given the opportunity to choose between young growing sweetpotato plants and sweetpotato roots, the adults fed almost exclusively on the roots and that all of the eggs were deposited in the roots.

INSECTS AFFECTING MAN AND ANIMALS

Kerosene-pyrethrum emulsion retains toxicity to mosquito larvae for long periods.--H. H. Stage, of the Portland, Oreg., laboratory, reports that tests with a kerosene-pyrethrum emulsion showed that this material had not lost its toxicity to third- and fourth-instar larvae of laboratory-reared *Aedes vexans* Meig. and *Aedes aldrichi* Dyar and Knab, when applied at the rate of 25 gallons per acre, even after this material had remained in storage for 5 years.

Effect of cold storage on the tick parasite *Hunterellus hookeri* How.--C. N. Smith, of the Martha's Vineyard, Mass., laboratory, in preliminary tests to determine methods for mass rearing of these parasites, has found that about 50° F. is the optimum temperature at which parasitized nymphal ticks can be held, although storage at 60° was fairly satisfactory. At 60° there is some development of the parasite inside the nymph, while at 50° there is less development, or possibly none. Storage for 21 days at these temperatures did not reduce emergence when the storage period began from 2 to 7 days after the parasitized nymphs had dropped, but caused considerable mortality when the parasites had developed for 12 or more days before storage. The longevity of adult parasites was also increased by storage at low temperatures. The most favorable temperature for storage appeared to be 50°. At 60° there was some activity of the parasite and consequently a shorter survival than at 50°, when all activity was suppressed. At 40° there was no activity of the parasite, but recovery was less satisfactory than at 50°. The maximum longevity at 50° was actually 13 days and the maximum at 60° was actually 11 days. Longevity at 80° was often less than 24 hours and almost invariably less than 48 hours.

Wettable sulphur apparently effective in controlling cattle lice.--Experiments conducted at the Sonora, Tex., laboratory by O. G. Babcock indicate that 325-mesh wettable sulphur is effective in controlling *Linognathus vituli* L., when animals are dipped three times at 11-day intervals. Fifty-eight head of cattle were used in these tests and at the time of the second dipping only a few lice could be found. One very heavily infested cow harbored only a few live female lice on the face and nose. After the third dipping not a single louse could be found on any of the cattle or calves. The strength of the dip was 10 pounds of sulphur to 100 gallons of water.

Glycero-boric acid apparently not effective as a preventive of screwworm infestation in wounds.--Tests conducted at the Dallas, Tex., laboratory indicate that glycero-boric acid, which has been reported as an excellent material for preventing blowfly "strike" of sheep in Australia, prevents only 65 percent infestations of wounds by *C. americana* for periods of 0 to 4 hours and is entirely ineffective after 28 hours.

Effect of temperature on sterility of primary screwworm fly.--According to experiments conducted at the Menard, Tex., laboratory, when pupae of *Cochliomyia americana* C. and P. develop at a temperature of 35° C. or higher, the resulting males are sterile, but the fertility of the females is apparently little affected. This phenomenon was not observed in *C. macellaria* and

Phormia regina Meig. (Menard strains) reared under similar conditions. These studies further indicated that from 2 to 4 days' exposure at high temperatures is required to produce sterility, the shorter period being during the early pupal development.

FOREIGN PLANT QUARANTINES

Damage to corks by a microlepidopteron.--Two living adults of the lyonetiid *Oinophila v-flava* Haworth were intercepted at New York on July 21, 1937, in a case of liquor in cargo from England. A. Busck reports as follows: "An interesting little moth of African origin, introduced long ago into Europe, where its larvae feed on a fungus, *Zosmidium*, growing in old wine cellars; quite commonly the corks of the wine bottles are attacked and made leaky, causing appreciable loss of wine in storage. This is, as far as I know, the first record in North America. The introduction of the species here is possible and should be guarded against."

Banana leaf spot.--The banana leaf spot (*Cercospora musae* Zimm.) (see News Letter dated March 1, 1938 (vol. V, no. 5, p. 11)) has been found in Puerto Rico. Its distribution there is not known as yet. An infected leaf fragment showing numerous spots of various sizes, some of the older ones with scattering acervuli, was found in cargo from Honduras on March 31 at Charleston, S. C. The leaf was heavily coated with blue spray deposit indicating that it was from one of the plantings which are kept sprayed with bordeaux mixture to hold the disease in check. Numerous spores were present on the leaf surface.

Helminthosporium sp. on tomato.--Several interceptions of a new fruit spot of tomato have been made, particularly at Brownsville, Tex., on tomatoes from Mexico. The spots are dark, grayish, and felt like. The fungus seems to be a species of *Helminthosporium* not reported as occurring on tomato. It is hoped that it will be possible to get the fungus in pure culture and its status determined by specialists. There has been sufficient spotting on some shipments to indicate that the disease might become quite serious. The fungus may be the same species as that intercepted on tomatoes from Haiti and noted on page 19 of the News Letter issued on March 1, 1938.

Entomological interceptions of interest.--A living larva of the Mexican fruitfly (*Anastrepha ludens* Loew) was intercepted at El Paso, Tex., on February 5 in a sapote in baggage from Mexico. Living larvae of the Mediterranean fruitfly (*Ceratitis capitata* Wd.) arrived at Boston on December 12, 1937, in a tangerine in ship's stores from Italy. Two living adults of the bruchid *Pheloneurus aberrans* (Sharp) were taken at Honolulu, Hawaii, on April 7, 1937, in a pod of *Cassia* sp. in the mail from the Canal Zone. A living specimen of the bean pod borer (*Maruca testulalis* Geyer) was intercepted at San Pedro, Calif., on November 29, 1937, with lei (*Canavalia* sp.) in a stateroom on a ship from Hawaii. Living adults of *Bruchus rufipes* Hbst. were found at New Orleans on December 6, 1937, in vetch seed mixed with rye-straw packing in cargo from Portugal. A living larva of the European corn borer (*Pyrausta nubilalis* Hbn.) was intercepted at Seattle, Wash., on January 4 in the center of a branch of *Paeonia* (Moutan) in cargo from Japan. Living specimens of the coreid *Mesocerus marginatus* L. were found at Washington, D. C., on December 30, 1937, with straw and moss packing for *Juglans*, *Corylus*, and grape cuttings in express from Poland. Thirteen living and two dead larvae of the pink bollworm (*Pectinophora gossypiella* Saund.) were taken at Chicago, Ill., on January 11 in two ounces of seed cotton in the mail from Italy. A living specimen of the earwig *Labia curvicauda* (Motsch.) was intercepted at San Francisco on November 30, 1937, on an orchid (*Cattleya* sp.) in cargo from Colombia. A living larva of the mango weevil (*Sternochetus mangiferae* F.) was intercepted at Blaine, Wash., on February 11 in a mango seed in a woman's purse from New Zealand. Six living adults of the weevil *Apion ulicis* Forst. arrived at New York on August 15, 1937, in furze (*Ulex* sp.) seed and pods in baggage from Ireland.

Pathological interceptions of interest.--*Cytospora* sp. was intercepted on *Macrozamia* sp. from Australia in mail at San Francisco on February 24. No previous reports of a *Cytospora* on this host were found. An interesting leaf spot of *Ruscus* in cargo from Italy was intercepted on March 16 at Philadelphia. The spots were large, irregular, light colored, and seemed to shade off to the color of the rest of the leaf in some places, instead of having a sharp margin. The pathogen was evidently a *Phyllosticta* but there was not enough material for study. *Puccinia incondita* Arth. (first interception) was intercepted on February 22 at Brownsville on *Solanum triquetrum*. Arthur's manual lists this rust as occurring on this host only and its distribution as southern Texas. Small sclerotia occurring in abundance on *Nerine appendiculata* and *N. sarniensis* could be determined as *Sclerotium* sp. only. The bulbs were intercepted in mail from South Africa on March 16 at Seattle. *Septoria alliorum* West. was the name given a fungus causing a disease of leeks from France intercepted on February 24 at New York, but the species description and specimen did not agree entirely.

DOMESTIC PLANT QUARANTINES

Grasshopper-control work under way.--Such activities as checking bait materials on hand, arranging for assistance by county agents, and meeting with farmers, are under way by the Federal and State forces in Colorado, Idaho, Iowa, Kansas, Minnesota, Montana, Nebraska, New Mexico, North Dakota, Oklahoma, South Dakota, and Texas and dates have been set for early conferences on organization work in other States. Training conferences with field workers were held in March at points in Texas, Oklahoma, and North Dakota. The uniform method of making nymphal surveys in order to determine the hatching time was covered at these conferences in order to determine the time for applying the first bait in the different localities of the various States. This information will be made available to county agents so that the job can be done effectively and with a minimum quantity of bait. Control methods as related to the biology of the insect, farm practices, and the extension program in the different States were also discussed. A manual of instructions has been supplied to supervisors and State leaders. An initial supply of bait has been shipped to each of the affected States where grasshoppers have developed to the stage where early control measures are needed. Supplies to other States will be made available in advance of the period when control work should be started.

Mormon cricket control work organized.--Personal contacts have been made with State officers in Colorado, Idaho, Montana, Nevada, Oregon, Utah, Washington, and Wyoming with the result that satisfactory cooperative working programs have been completed in each of these States. The key personnel has been selected, district supervisors appointed, and initial purchases made of poison dust. Small dusting units of from ¾ to 1 h.p. are being purchased by the States and other organizations. Suboffices have been established at Boise, Idaho, and Billings, Mont., the latter through the cooperation of the University extension service. The area to be dusted in the above States and in North Dakota and South Dakota is estimated at 454,500 acres.

Inspection for larvae of white-fringed beetle.--Larval inspection is being conducted in the vicinity of New Orleans, La., in Harrison and Jones Counties, Miss., and in Mobile and Baldwin Counties, Ala., with special attention to nurseries and to properties adjacent to known infested areas. An infestation of Naupactus leucoloma Boh. was recently found at New Orleans on a 10-mile area along the river front, contiguous to the known infested area. The new species of Naupactus was also found at Long Beach, Miss., near Gulfport.

White-fringed beetle control activities.--Surveys are approaching completion for the construction of outside barrier ditches and rights-of-way around infested properties in the Mississippi towns of Laurel, Gulfport, Landon, McHenry, and Saucier in the same manner that such barriers were constructed last year in the Florala, Ala., area. In the latter area, the work of discing land, clearing fence rows and brush land, and constructing terraces is approaching completion. Contact work with farmers and property owners is completed in all infested areas except Pensacola, Fla., and in all these areas the indications are, according to project leader J. M. Corliss, that "cooperation will be all that could be hoped for." The educational campaign which has been carried on throughout the winter and participated in by various organizations such as Rotary Clubs, extension entomologists, county agents, and local groups, has proved well worth while. Personal contacts are necessitated in many instances, owing to the large population of negroes that cannot be reached in any other way. In New Orleans idle land near the docks has been cleared and ditches and levees are being constructed for the purpose of flooding the known infested area in this lowland at about the peak of the pupal period and keeping it flooded until emergence is over. This plan has the sanction of cooperators. A light film of oil to be used on the water is expected to be effective against adult beetles that may be trapped therein.

Sweetpotato weevil inspection and eradication.--Survey work in March was extended into new territory in 16 counties in Texas, Mississippi, and Alabama, and weevils were found in the Texas counties of Sabine and San Augustine. Such a survey was made possible through the examination of old storage banks, which were then cleaned and destroyed. A heavy infestation of sweetpotato weevils found on seaside morning-glories on Mobile Bay is believed to be the source of an infestation of sweetpotatoes found last summer a mile away in Mobile County, Ala. The State is employing W. P. A. labor to eradicate the morning-glories in two counties and to clean sweetpotato fields. Inspection has been made, jointly with the States, on practically all properties where infestation was located last summer in the States of Alabama, Georgia, Louisiana, Mississippi, and Texas. Spring volunteer plants are now appearing in the fields and inspectors are making every effort to have them eradicated. The trapping of sweetpotato weevils by placing occasional tubers in cleaned fields has proved to be an important factor in determining the weevil population in a given area and the extent of the infestation.

Peach-inspection force increased.--The States affected by the phony peach and peach mosaic diseases are increasing their inspection force for the coming field season. Of the 190 inspectors, the States are assigning 52, the counties 10, and 42 inspectors are relief employees who are trained to carry on such work. There is increased cooperation in the West. Considerable educational work has been done in the high-school agricultural classes, civic clubs, and other organizations.

Peach tree-removal activities extended.--An additional allotment of $16,000 from the emergency relief appropriation will make it possible to extend the work of removing abandoned peach orchards in the States affected with the peach mosaic disease. The eradication of abandoned and escaped peach trees for the control of the peach mosaic and phony peach diseases was continued in March in Alabama, Arkansas, Georgia, South Carolina, Tennessee, California, Colorado, New Mexico, and Texas. Field work in Utah is being resumed.

Summary of citrus canker work 1935-37.--A report of the results of citrus canker activities to the close of 1937 shows that in this 2-year intensive campaign of Federal-State inspection, 58 properties were found infected, of which 46 were in Texas and 12 in Louisiana, all in the noncommercial citrus-growing areas. Only 35 properties had been reported in Texas during the 13 preceding years. In 1937, canker was found on three properties in Louisiana and two in Texas. These were in areas formerly known to be infected. Ninety-nine percent of the abandoned and escaped citrus trees have been destroyed in the infected areas, the remaining trees consisting principally of yard plantings of satsumas resistant to canker and easily inspected.

Citrus canker program for 1938.--The eradication project has reached the stage where the work in the infected States will consist principally in reinspecting the relatively few plantings of edible citrus, inspecting each spring and fall all properties found infected since 1935, and reworking with labor crews all properties where parent trees have been destroyed, doing this work chiefly in the fall and winter when tiny seedlings are more easily distinguished. Oil will be applied to prevent further seedling growth. Some inspection will be done in Alabama. As heretofore, the work will be done jointly with State inspectors.

Willful violators fined.--Transit inspection at the New York City flower markets during the last Christmas season resulted in the prosecution and fine of $25 of a trucker who had transported Christmas greenery from Connecticut to New York without gypsy moth inspection and certification.

Peach nursery stock shipments checked.--Transit inspectors are checking shipments of peach and other host plants of phony peach and peach mosaic diseases and supplying State officers with information as to any violations of State quarantines relating to these pests.

Japanese beetle quarantine regulations revised.--The regulations of Federal quarantine No. 48 were revised, effective April 11, to include as the principal change the extension of regulated area in New York, Pennsylvania, Ohio, Maryland, Virginia, and West Virginia.

CONTROL INVESTIGATIONS

Deposits of lead arsenate from talc-lead arsenate dusts.--In laboratory tests with a dust made of lead arsenate and talc, E. R. McGovran and Percy Jones, of the Beltsville, Md., laboratory, in cooperation with L. D. Goodhue and C. C. Cassil, of the Division of Insecticide Investigations, report that the percentage of lead arsenate in dust deposited in a settling chamber varied considerably. When a fraction of talc made up of fine particles of fairly uniform size was mixed with lead arsenate and the deposits collected for 20, 30, and 245 seconds, at intervals of 5, 25, and 55 seconds, respectively, after the dust was released, the amounts of lead arsenate in the deposits were 3.04, 3.12, and 2.59 percent, respectively. As compared with this, when commercial talc was mixed with lead arsenate and the deposits collected for 10, 35, and 550 seconds at intervals of 5, 15, and 50 seconds, respectively, after the dust was released, the amounts of lead arsenate in the deposits were 2.41, 3.23, and 4.95 percent, respectively. The fine talc mixture contained 2.81 percent lead arsenate and the commercial talc mixture, 2.89 percent. It was also reported that the fine talc-lead arsenate dust mixture was slightly more toxic to southern armyworm larvae than was the commercial talc-lead arsenate dust.

INSECTICIDE INVESTIGATIONS

Method for analysis of phenothiazine.--L. E. Smith has described a method for the chemical evaluation of commercial phenothiazine sold for use as an insecticide, which consists in extracting the material in a tared Soxhlet thimble with ether in the usual manner (Indus. Engin. Chem. Analyt. Ed., vol. 10, no. 2, p. 60, Feb. 15, 1938). The residue, which consists of the impurities present, is determined from the increase in weight of the dried thimble. Six samples of phenothiazine sold for use as an insecticide when analyzed in this way tested better than 98-percent pure.

An improved crystallization method for determination of rotenone in derris and cube.--H. A. Jones and J. J. T. Graham have recently described a method for the determination of rotenone in samples of roots (Jour. Assoc. Off. Agr. Chem., vol. 21, no. 1, pp. 148-151. Feb. 1938). The finely powdered root is extracted with chloroform and the rotenone in an aliquot of the filtered extract is determined according to a modification of the carbon-tetrachloride method. In the analyses of 31 samples of derris and cube, some containing as high as 10 percent rotenone, the results of the two authors never differed more than 0.4 percent, and the average difference was only 0.2 percent. Equally as good results should be obtained by any careful analyst.

Determination of nicotine on apples sprayed with nicotine bentonite.--L. N. Markwood has described a method for determining the small quantities of nicotine remaining on apples after they have been sprayed with nicotine bentonite (Jour. Assoc. Off. Agr. Chem., vol. 21, no. 1, pp. 151-155. Feb. 1938). The nicotine residue is removed from the apples by dipping them in boiling dilute hydrochloric acid containing a small quantity of brucine. Brucine, an alkaloid which is not volatile with steam, replaces the nicotine in the bentonite. Recovery by this method is practically 100 percent.

Wetting properties of triethanolamine oleate.--H. L. Cupples has tested the wetting properties of solutions of triethanolamine oleate according to the methods developed by him for the study of wetting properties of various soaps (Jour. Econ. Ent., vol. 31, no. 1, pp. 68-70. Feb. 1938). At concentrations from 0.01 to 1.00 percent oleic acid the wetting power of aqueous triethanolamine-oleic acid mixtures increases with increase of the ratio of triethanolamine to oleic acid, at least up to the mole ratio 6.0. At moderatly high concentrations, such as 1.00 percent oleic acid, there is no abrupt change in wetting properties in the vicinity of the ratio 1.00 (point of equivalence), such as occurs when the base is a caustic alkali. Solutions of triethanolamine oleate readily produce a stable foam and the material has a number of desirable properties which make it an efficient wetting agent.

Effect of insect attack on rotenone content of stored cube root.--H. A. Jones has reported the analysis of cube root infested with *Dinoderus bifoveolatus* Woll. (Jour. Econ. Ent., vol. 31, no. 1, p. 127. Feb. 1938). The rotenone content of the powder produced by the insects tunneling through the root was only about one-fourth to one-half as much as that of the original whole root. However, there was no reduction in the rotenone content of the entire material as the result of the insect attack, as shown by the fact that the net rotenone content of the whole sample, when the relative weights of whole root and powder are taken into account, was about the same as that of the original sample of whole root.

A new constituent of pyrethrum flowers.--W. G. Rose and H. L. Haller have reported the occurrence of a colorless crystalline compound in pyrethrum flowers (Jour. Organic Chem., vol. 2, no. 5, pp. 484-488. Nov. 1937, rec'd. April 1938). This compound melts at 201° C. and has the formula $C_{17}H_{22}O_5$. This compound has been called chrysanthine.

New synthetic insecticides patented.--D. L. Vivian and H. L. Haller have recently been granted four United States patents covering the use as insecticides of certain synthetic organic compounds. U. S. Patent 2,110,614 covers the use of phenazine as an insecticide. This has shown promising results when tested against codling moth larvae. U. S. Patent 2,110,896 covers the use as an insecticide of 1-(o-tolylazo)-2-naphthol and certain other azo compounds. In preliminary tests these have shown high toxicity to mosquito larvae. U. S. Patent 2,110,897 covers the use as an insecticide of 4-phenylazo-1-naphthol and certain related compounds. These also are quite toxic to mosquito larvae. U. S. Patent 2,111,879 covers the use as an insecticide of 1-phenylazo-2-naphthylamine and certain related compounds. At a concentration of 1 part to 200,000 parts of water this compound killed 94 percent of culicine mosquito larvae within 16 hours.

BEE CULTURE

Shaking stimulates brood rearing.--Warren Whitcomb, Jr., of the Southern States bee culture laboratory, Baton Rouge, La., reported at the end of March that preliminary data this year indicate, as did last year's data, that queens in colonies subjected to heavy shaking tend to be stimulated in their brood-rearing activity and thus are able to maintain their normal populations. He also stated: "To date colonies shaken heavily this season have yielded 9.5 pounds of bees per colony, colonies shaken lightly have yielded 4.0 pounds of bees, two 2-queen colonies shaken at 7-day intervals have yielded 18.8 pounds, and two 2-queen colonies shaken at 10-day intervals have yielded 12.6 pounds. A study of populations in these colonies at present would not reveal significant difference."

Bees require low relative humidity and high temperature.--A. W. Woodrow, of the Intermountain States bee culture laboratory, Laramie, Wyo., reports that continued experiments on the effects of relative humidity on caged bees support his previous findings that relative humidities of from 20 to 30 percent, with the temperature at 85° F., are much more favorable to the bees than are higher relative humidities. The length of life of bees fed 50-percent-sucrose solution was from two to seven times as great with such relative humidities as that of bees kept at relative humidities of from 53 to 86 percent. A 50-percent-sucrose solution is a more satisfactory food than honey or cedar honeydew.

IDENTIFICATION AND CLASSIFICATION OF INSECTS

Larvae of an economic South American weevil added to collection.--E. J. Hambleton, of Sao Paulo, Brazil, has recently forwarded for the National Museum collection a large number of nicely preserved specimens of the curculionid Gasterocercodes braziliensis Hambleton. This species, which is an important pest of cotton in Brazil, has been intensively studied by Mr. Hambleton, who has recently published an excellent paper discussing it in detail.

Sitophilus oryza L.--The specific name of the rice weevil, usually spelled oryzae, is properly spelled oryza.

Another European weevil recorded from North America.--A specimen of Brachyrhinus raucus F., a European species, labeled "Toronto, Canada, VI-18-37, N. S. Parish," has been presented to the National Museum by Peter C. Ting, of the California Department of Agriculture, who has two similarly labeled specimens. The species has not been previously reported from North America. It is said to be common and widely distributed in Europe, where it has been reported as injurious to a variety of plants.

Tabanus oklahomensis Stone in the Carolinas.--In a small lot of Tabanidae from L. L. Pechuman were a male and female collected along Route 301 on April 2, 1937--one near Florence, S. C., the other in North Carolina. The only other material of this species in the National Museum consists of a number of specimens collected in April in Atoka and Johnston Counties, Okla. The species is closely related to *T. carolinensis* Macq., which occurs commonly in the East but also extends to Oklahoma. The two species are quite distinct, although *carolinensis* has been collected in Oklahoma and *oklahomensis* in the Carolinas. The former flies until late in July, whereas the latter has never been collected after April 26.

Additions to blackfly collection.--C. R. Twinn, of the entomological branch, department of agriculture, Ottawa, Canada, recently visited the National Museum, bringing with him for deposit here a number of Canadian Simuliidae, including paratypes of nine species not hitherto represented in the collection. Mr. Twinn spent several days studying the Dyar and Shannon species and took with him a number of specimens in exchange for those he brought.

Note on a parasitic ant.--On July 4, 1936, J. C. Bridwell collected at Kearney Station, Arlington County, Va., a winged queen of a species of *Anergates*, which, in the opinion of M. R. Smith, may prove to be that of the European *atratulus*. This record is of more than usual interest in that this appears to be only the second time that any species of *Anergates* has been taken in North America. *A. atratulus* (Schenck), which is represented only by the queen and male castes, is an interesting parasite of the European pavement ant (*Tetramorium caespitum* (L.)). The host species when parasitized contains only the worker caste.

New distribution and host records for a recently described aphid.--*Rhopalosiphum subterraneum* Mason was identified from *Haworthia margaritifera* (San Francisco Interception No. 13552) and from *Echinocactus guehlianus* (San Francisco Interception No. 13553), both from Japan. This aphid, which is injurious to cotton roots in the southeastern seaboard area, has been taken from a number of hosts in the United States, but never from *Haworthia* or members of the cactus family. This is the first record from foreign countries.

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